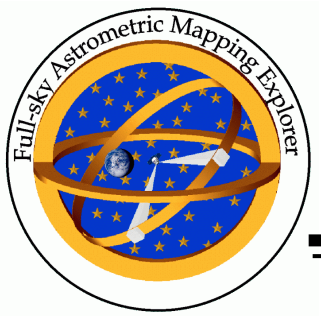
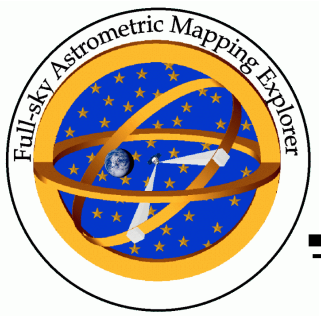


LOCKHEED MARTIN

Instrument Thermal Model Results

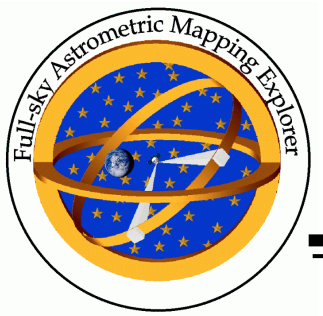
Jay Ambrose

FAME TIM
LMMS Advanced Technology Center
Palo Alto, CA
February 6-6, 2001



Topics

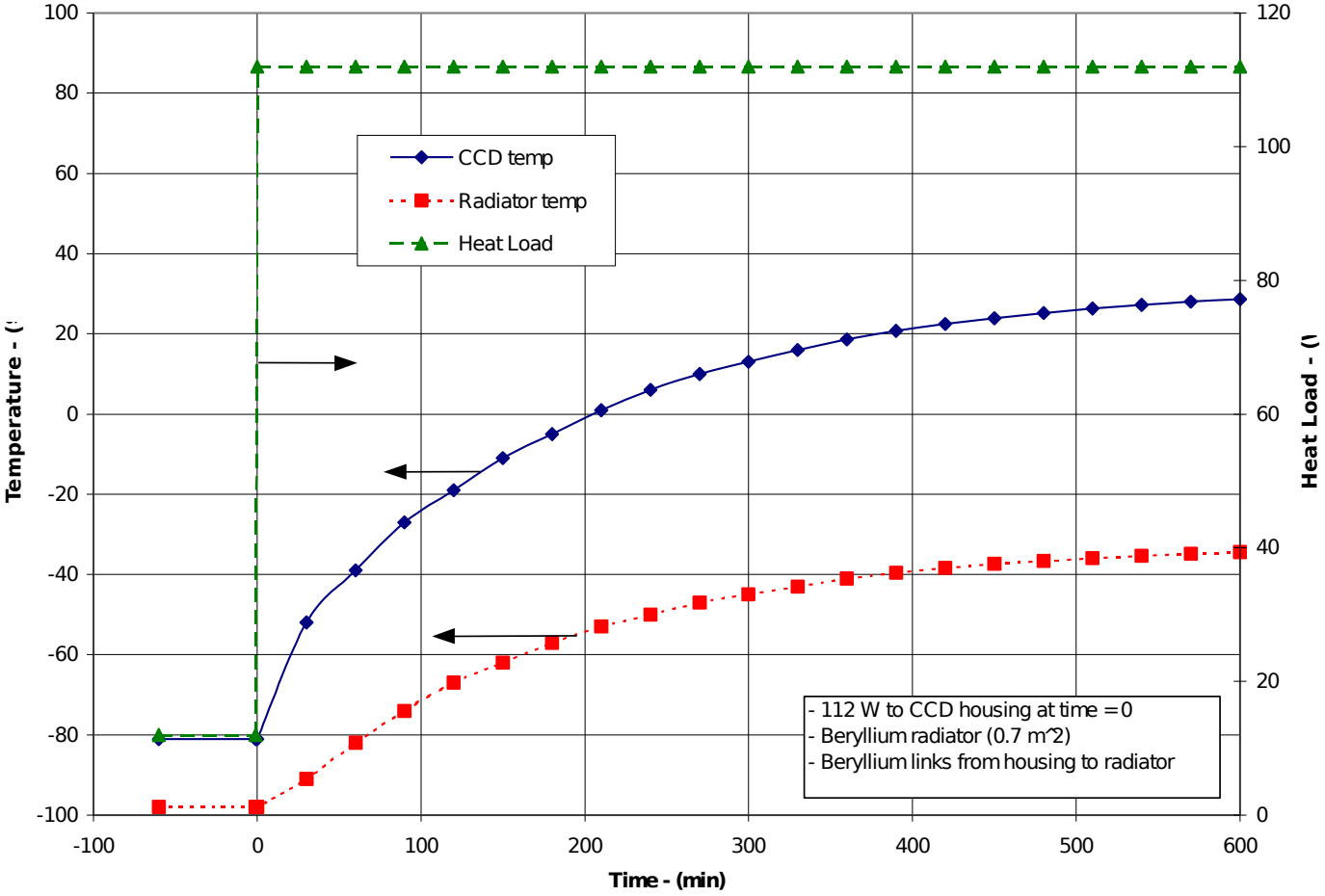
- Direct Solar Illumination - Aperture Door Trade Studies
- Updated Thermal Model Results
- Further Studies on Sunshield Blanketing
- Swept Sunshield

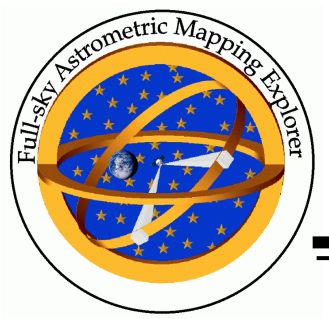


Direct Solar Illumination Analyses

- Assume full sun collimated in aperture
- Results in approximately 100 W of absorbed solar energy on the FPA
- Including electronics, waste heat load of 12 W and heat rejection from the FPA Radiator, maximum CCD temperature = 43 ◦C
- Additional detailed studies are being performed to verify acceptable thermal transients on CCD/window

Direct Solar Illumination Analyses

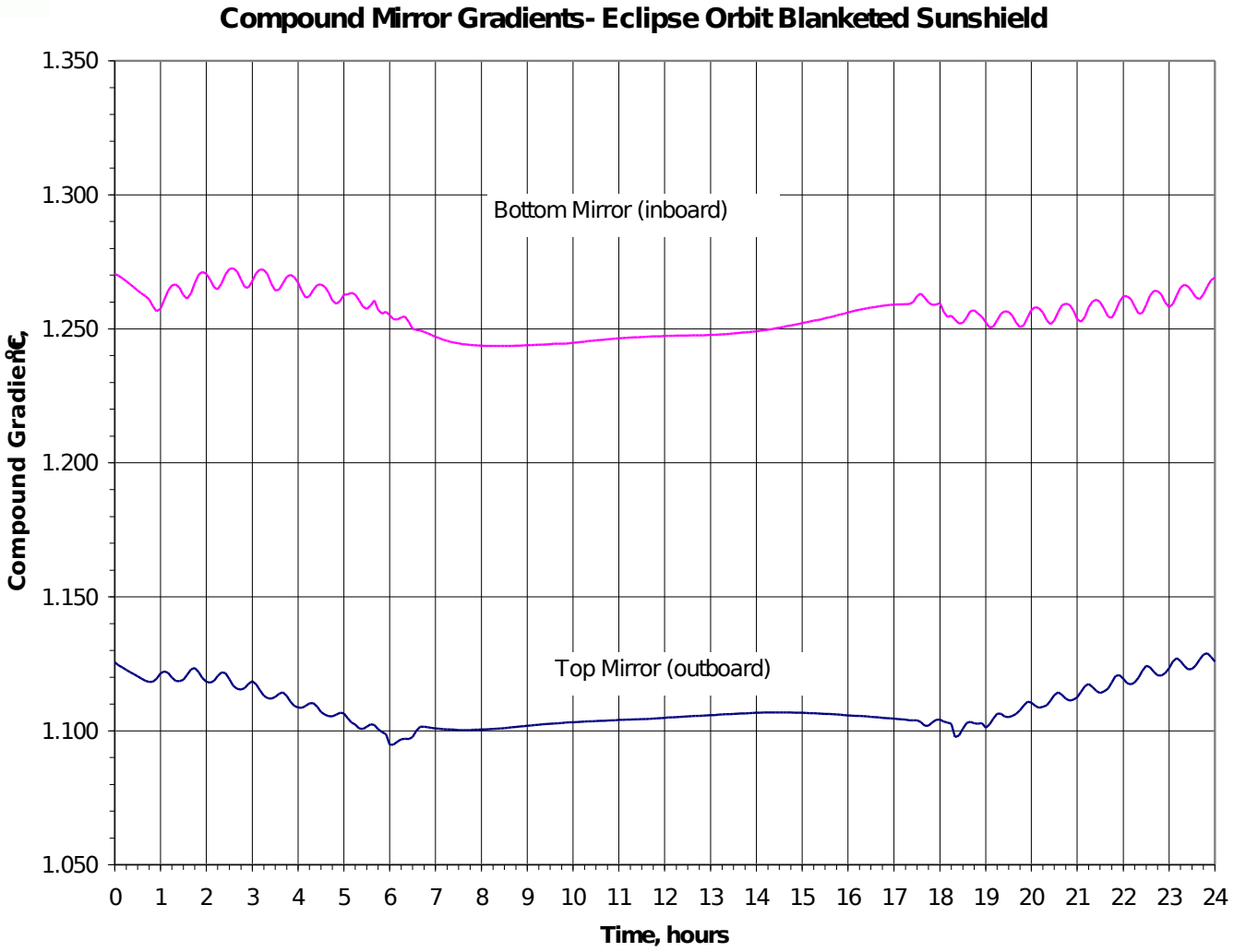




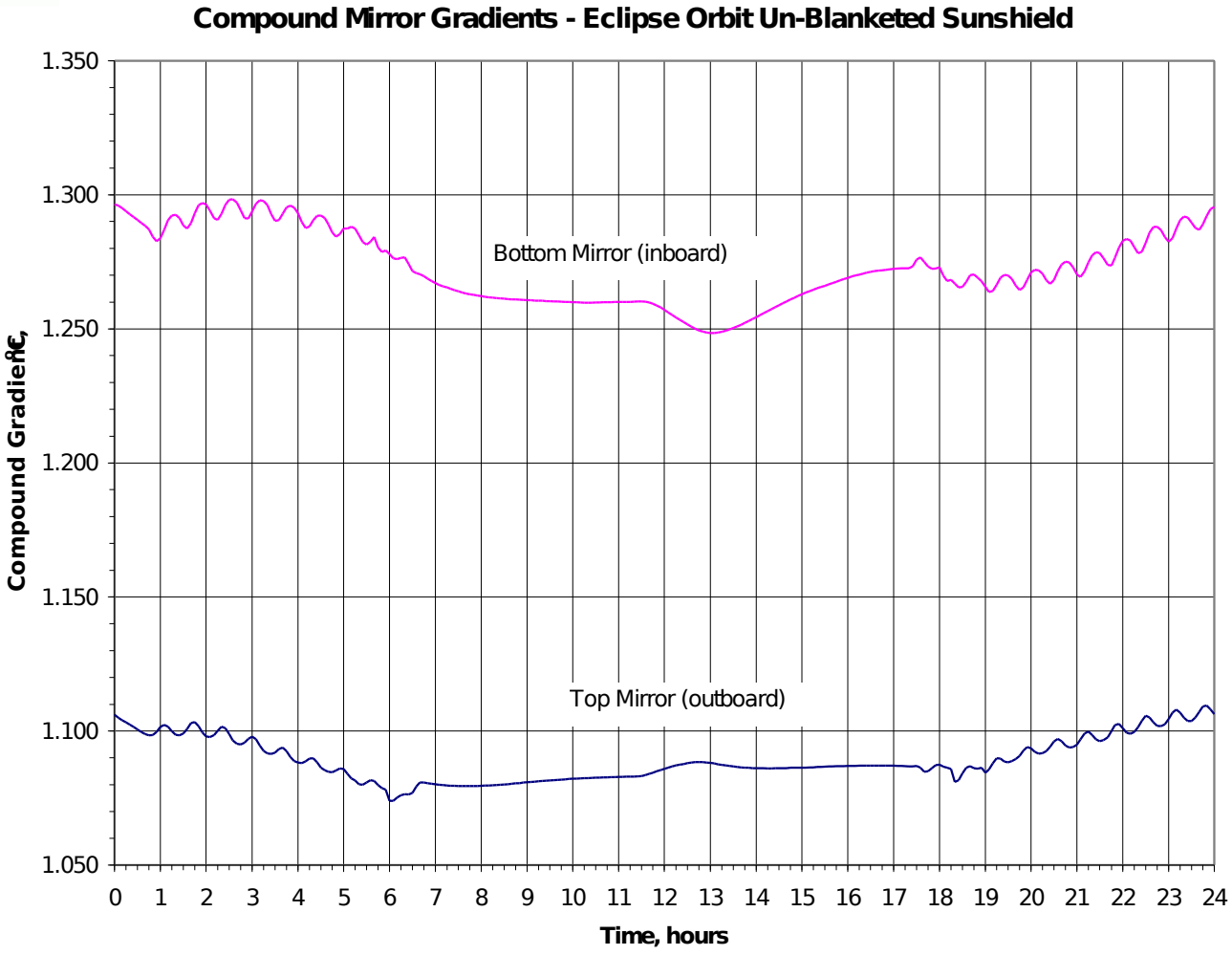
Updated Thermal Model Results

- Detailed TMG orbital heat load model used to resolve effects of 40 minute spin and 24 hour orbit
- Requires larger number of orbital heating calculation points (order of 300, variable spacing)
- Results for compound mirror and truss structure show 40 minute spin effects perpetuate about earth-crossing orbit points, particularly for ‘bottom’ compound mirror (mirror closer to sunshield)

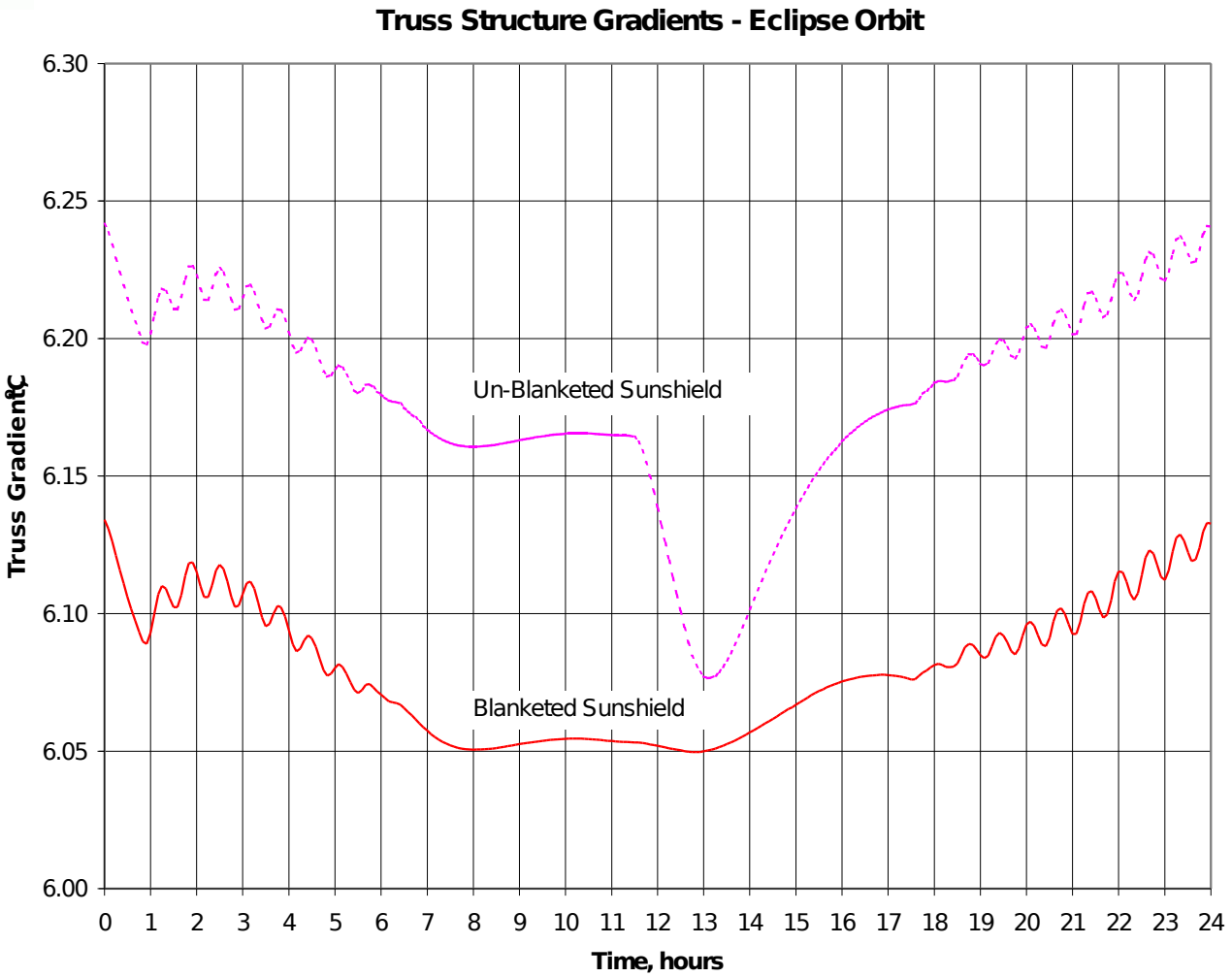
Updated Thermal Model Results

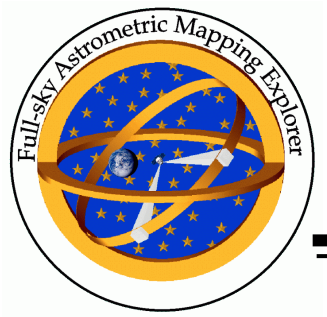


Updated Thermal Model Results



Updated Thermal Model Results

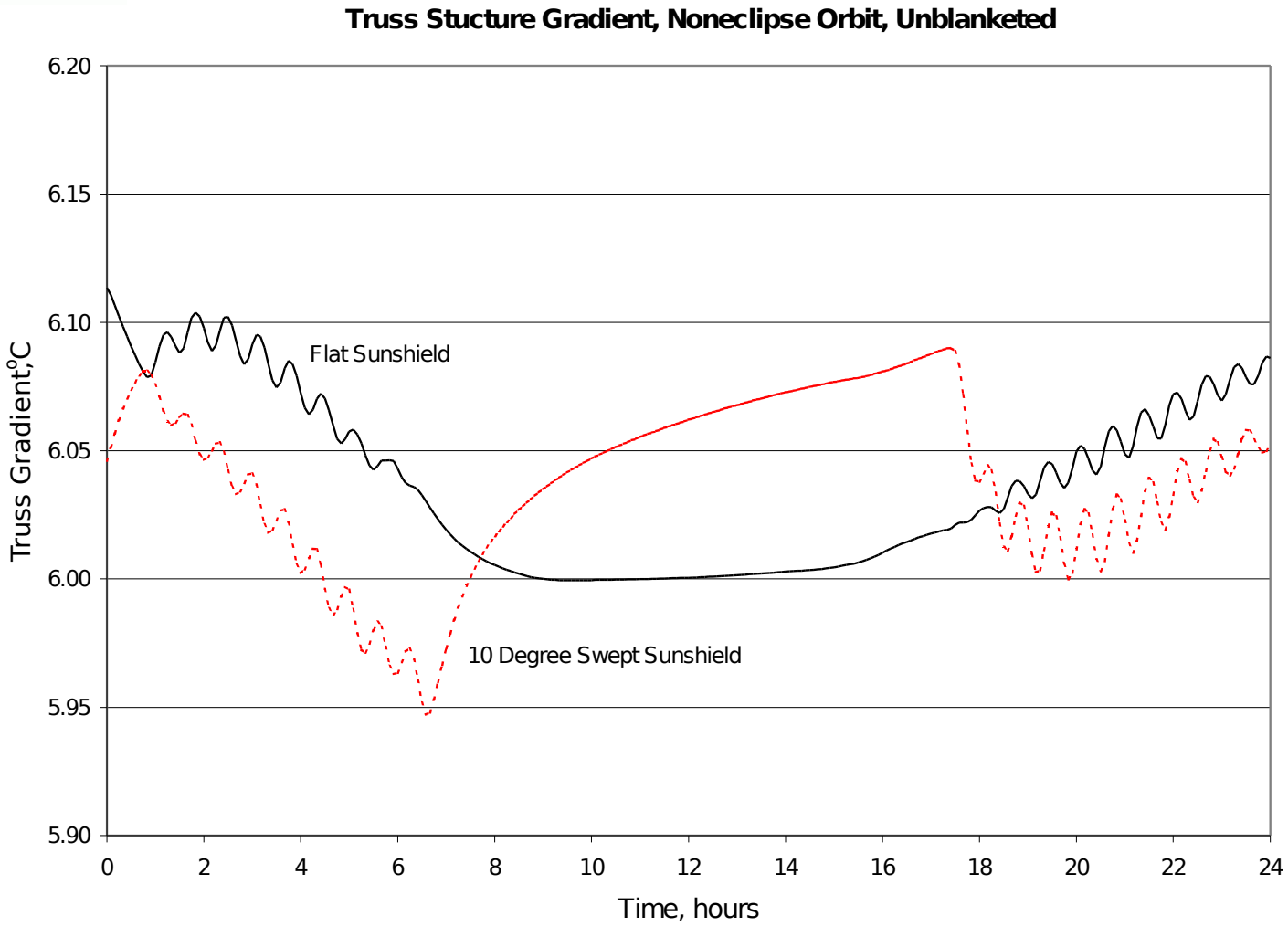




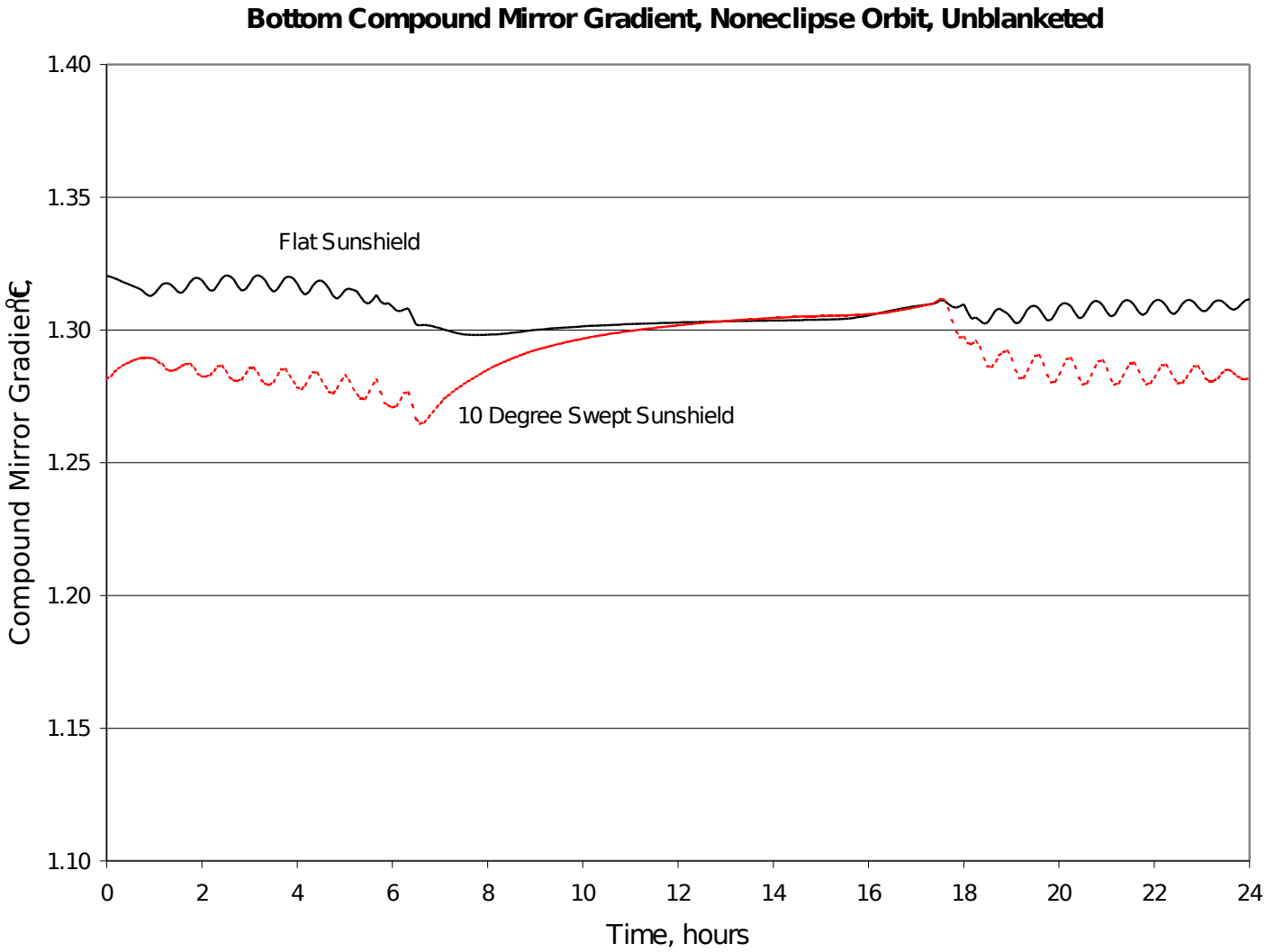
Updated Thermal Model Results

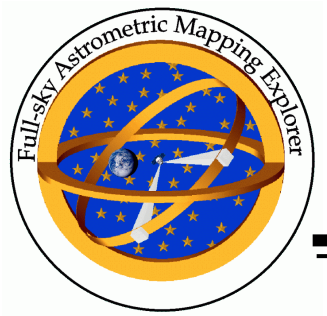
- Un-Blanketed Sunshield results in approximately double the 24 hour variation on bottom compound mirror (0.05 ◦C versus 0.025 ◦C) than blanketed case
- Effect on top compound mirror is smaller, since it is further from the sunshield
- Truss gradient excursion of ~ 0.085 ◦C during eclipse, lasting 4 hours

Swept Sunshield



Swept Sunshield





Updated Thermal Model Results

- Swept sunshield results in approximately 50% larger 40 minute and 24 hour variations on truss structure gradient for an un-blanketed sunshield
- Bottom compound mirror 24 hour variations are about doubled, top compound mirror gradients increased by about 10%